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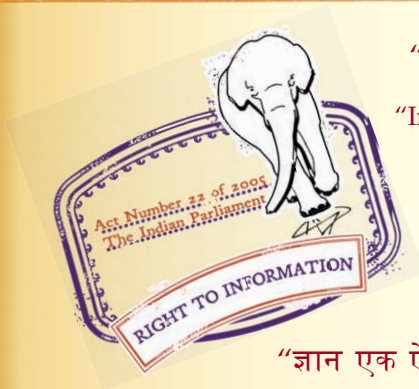
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IS 2254 (1985): Dimensions of vertical shaft motors for pumps [ETD 15: Rotating Machinery]



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“Knowledge is such a treasure which cannot be stolen”

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(Reaffirmed 2002)

Indian Standard

DIMENSIONS OF VERTICAL SHAFT MOTORS FOR PUMPS

(*Second Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

DIMENSIONS OF VERTICAL SHAFT MOTORS FOR PUMPS

(*Second Revision*)

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Indian Standard

DIMENSIONS OF VERTICAL SHAFT MOTORS FOR PUMPS

(*Second Revision*)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 26 November 1985, after the draft finalized by the Rotating Machinery Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard was first published in 1964 and its first revision was issued in 1965 in which certain ambiguities about the applicability of requirements to either solid shaft or hollow shaft motors were eliminated.

0.3 The second revision of this standard has been carried out to include:

- a) Standard flange numbers and frame numbers specified in IS:2223-1983*,
- b) Dimension of hollow shafts and its couplings, and
- c) Shaft extension runouts, concentricity of mounting rabbet and perpendicularity of mounting face to the shaft.

0.4 Owing to the pattern of the pump industry in India following NEMA practice, and also similar practice followed all over the world, the present revision retains the dimensions of coupling and flanges specified in NEMA MG 1-18.591. 'Integral Horsepower AC Squirrel Cage Induction Motors—dimensions for Type P and PH Alternating Current Squirrel Cage Vertical Hollow Shaft Motors for Vertical Turbine Pump Applications'. In this standard, these dimensions have been converted to metric units and rounded slightly except in the case of dimension 'N' for which calculated equivalent has been given owing to its being critical. The screw threads in driven half coupling dimension 'BY' have been recommended from IS:4218†.

*Dimensions of flange mounted ac induction motors (*second revision*).

†ISO metric screw threads.

0.5 The motors covered by this standard are intended mainly for driving vertical pumps.

0.6 Due care should be given to the design of motor bearings to take care of axial thrust on motor bearing due to the rigidly coupled pumps, which do not have provision of their own for withstanding the thrust. The values of axial thrust should be agreed in consultation with the pump manufacturers.

0.7 The motors covered by this standard shall meet the requirements specified in IS: 325-1978* or IS: 7538-1975† as may be relevant.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the dimensional requirements for vertical, solid and hollow shaft motors for driving turbine pumps.

1.2 This standard does not recommend the values of axial thrust on rigidly connected motors (*see* 0.6).

2. LETTER SYMBOLS

2.1 For the purpose of this standard, the following letter symbols shall apply for both solid and hollow shaft motors shown in Table 1 and Table 2:

- D = Diameter of shaft extension,
- E = Length of shaft extension from the shoulder,
- F = Width of keyway,
- GA = Distance from top of key to opposite side of shaft,
- GD = Thickness of key,
- G = Distance from the bottom of keyway to opposite surface of shaft extension,

*Specification for three-phase induction motors (*fourth revision*).

†Specification for three-phase squirrel cage induction motors for centrifugal pump for agriculture application.

‡Rules for rounding off numerical values (*revised*).

<i>M</i>	==	Pitch circle diameter of fixing holes,
<i>N</i>	==	Diameter of mounting rabbet (female part of spigot),
<i>P</i>	==	Outside diameter of flange,
<i>S</i>	==	Diameter of fixing holes in the flange,
<i>T</i>	==	Depth of spigot or mounting rabbet,
<i>XG</i>	==	Diameter of hole in the hollow shaft,
<i>BX</i>	==	Diameter of bore in top driven half coupling for hollow shaft vertical motor,
<i>BY</i>	==	Diameter of mounting holes in top driven half coupling for hollow shaft vertical motors, and
<i>BZ</i>	==	Pitch circle diameter of mounting holes in top driven half coupling for hollow shaft vertical motor.

3. FLANGE DESIGNATION AND ITS FIXING DIMENSIONS

3.1 The flange numbers in Table 1 correspond to the pitch circle diameter of the fixing holes in millimetres. The letter *F* is added in solid shaft motors to indicate the flange mounting. The flange number in Table 2 corresponds to the outer diameter of the flange. The letter *V* is added in hollow shaft motors to indicate the flange mounting.

3.2 The flange number and corresponding fixing dimensions for the vertical solid and hollow shaft motors shall be as given in Table 1 and Table 2 respectively.

4. COUPLINGS FOR HOLLOW SHAFT MOTORS

4.1 The recommended sizes of couplings for hollow shaft motors are given in Table 3.

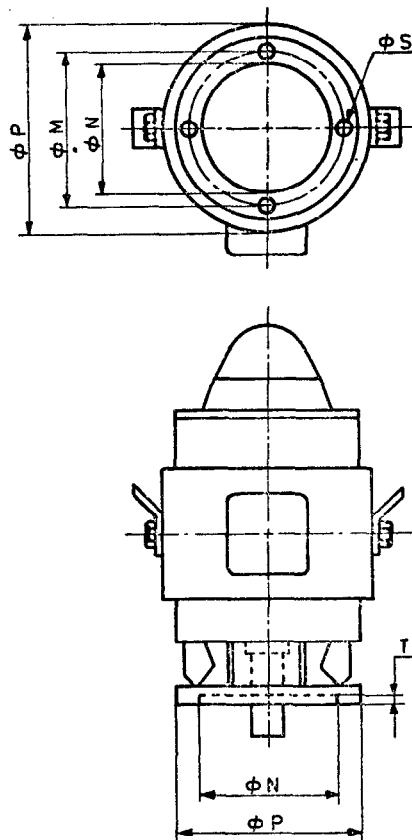
4.1.1 The keys shall be of gib head type conforming to IS:2293-1974*.

*Specification for gib-head keys and keyways (*first revision*).

**TABLE 1 FLANGE DESIGNATION AND FIXING DIMENSIONS
OF VERTICAL SOLID SHAFT MOTORS**

(Clauses 2.1, 3.1 and 3.2)

All dimensions in millimetres.



(Continued)

**TABLE 1 FLANGE DESIGNATION AND FIXING DIMENSIONS
OF VERTICAL SOLID SHAFT MOTORS — Contd**

FLANGE NUMBER	P	M	TOL	N	TOL	S		T	RECOMMENDED FRAME NUM- BER FROM IS: 1231-1974†	
						Size No.*			Motors hav- ing degree of protection IP 21, IP 22, IP 23 (see IS: 4691-1985‡) and method of cooling IC 01 (see IS: 6362-1971§)	Motors hav- ing degree of protection IP 44, or super- ior (see IS: 4691-1985‡) and method of cooling IC 41 (see IS: 6362-1971§)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
F232B	255 } 305 }	232	±0.3	209.55	+0.076 -0.000	11	4	6	132 160	132 160
F375B	420 } 510 } 625 }	375	±0.5	342.9	+0.127 -0.000	18	4	6	180, 200 225, 250 280	180, 200 225, 250 180, 315
F661B	775	661	±1	558.8	+0.127 -0.000	21	4	6	315	355

NOTE — The permissible concentricity of mounting rabbet and face runout shall be in accordance with Table 7 of IS:2223-1983||.

*The fixing holes are provided on axis.

†Dimensions of three-phase foot-mounted induction motors (*third revision*).

‡Degrees of protection provided by enclosures for rotating electrical machinery (*first revision*).

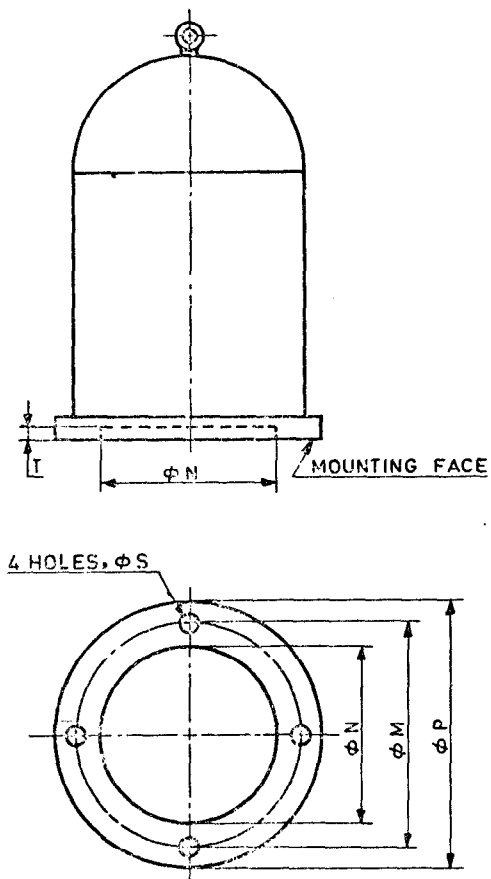
§Designation of methods of cooling for rotating electrical machines.

||Dimensions of flange mounted ac induction motors (*second revision*).

**TABLE 2 FLANGE NUMBER AND FIXING DIMENSIONS OF
VERTICAL HOLLOW SHAFT MOTORS**

(Clauses 2.1, 3.1 and 3.2)

All dimensions in millimetres.



(Continued)

TABLE 2 FLANGE NUMBER AND FIXING DIMENSIONS OF VERTICAL HOLLOW SHAFT MOTORS — *Contd*

FLANGE NUMBER	P	M	N	S	T	BX*	RECOMMENDED FRAME NUMBER FROM IS : 1231-1974†	
							Motors having degree of protection IP 21, IP 22, IP 23 (<i>see</i> IS:4691-1985‡) and method of cooling IC 01 (<i>see</i> IS: 6362-1971§)	Motors having degree of protection IP 44, or superior (<i>see</i> IS:4691-1985‡) and method of cooling IC 41 (<i>see</i> IS: 6362-1971§)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
V255	255	232	209.550+0.076 -0.000	11	6	19.10 19.08	132	132
V255	255	232	209.550+0.076 -0.000	11	6	25.43 25.45	160	160
V305	305	232	209.550+0.076 -0.000	11	7	25.43 24.45	180	—
V420	420	375	342.900+0.127 -0.000	18	7	30.18 30.20	200	—
V420	420	375	342.900+0.127 -0.000	18	8	36.55 36.53	250	—
V510	510	375	342.900+0.127 -0.000	18	8	42.90 42.86	280	—
V625	625	375	342.900+0.127 -0.000	18	8	69.92 69.88	315	—

*See Table 3 for fixing details of driven half coupling and its keyway.

†Dimensions of three-phase foot-mounted induction motors (*third revision*).

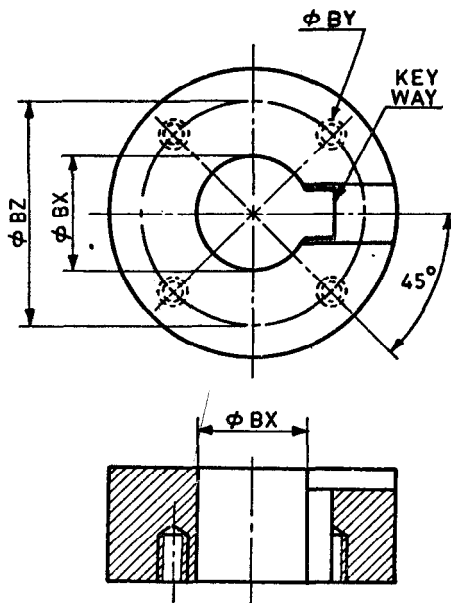
‡Degrees of protection provided by enclosures for rotating electrical machinery (*first revision*).

§Designation of methods of cooling for rotating electrical machines.

TABLE 3 RECOMMENDED SIZES OF DRIVEN HALF COUPLING AND ITS KEY WAY

(Clause 4.1)

All dimensions in millimetres.



BX	BY	BZ	KEYWAY	
			Width	Depth
19-10 19-08	M5 $\times$ 0.8*	35	4.77	2.45
25-43 25-45	M5 $\times$ 0.8*	35	6.36 6.35	3.24 3.18 (for flange No. V305)
30-18 30-20	M6 $\times$ 1*	44.5	6.35	3.18
36-55 36-53	M6 $\times$ 1*	54	9.50	4.76
42-90 42-86	M6 $\times$ 1*	63.5	9.50	4.76
69-92 69-88	M6 $\times$ 1*	95	15.88	7.94

*Details of the screw threads are given in IS:4218 (Part 2)-1976 ISO metric screw threads; Part 2 Diameter pitch combinations (first revision).

5. SHAFT EXTENSION DIMENSIONS OF SOLID SHAFT MOTORS

5.1 The shaft extension dimensions of solid shaft motors (see Fig. 1) shall be in accordance with Table 2 of IS: 1231-1974*.

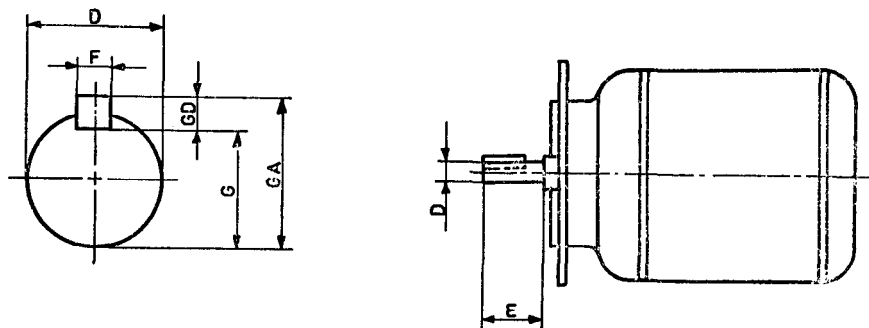


FIG. 1 SHAFT EXTENSION DIMENSION OF SOLID SHAFT MOTOR

5.2 The shaft extension runout of solid shaft motors when measured in accordance with 8 of IS:2223-1983† shall not exceed the values given in Table 4.

TABLE 4 ACCURACIES OF SHAFT EXTENSION RUNOUT

DIAMETER OF SHAFT EXTENSION	SHAFT EXTENSION RUNOUT	
	Normal Class	Precision Class
(1)	(2)	(3)
mm	μm	μm
Up to and including 10	30	15
Over 10 up to and including 18	35	18
Over 18 up to and including 30	40	21
Over 30 up to and including 50	50	25
Over 50 up to and including 80	60	30
Over 80 up to and including 120	70	35
Over 120 up to and including 140	80	40
Over 140 up to and including 160	90	50

*Dimensions of three-phase foot-mounted induction motors (*third revision*).

†Dimensions of flange mounted ac induction motors (*second revision*).

6. CONCENTRICITY OF SPIGOT (OR MOUNTING RABBET) AND PERPENDICULARITY OF MOUNTING FACE TO SHAFT

6.1 Tolerances for Solid Shaft Motors — The concentricity of spigot (or mounting rabbet) and perpendicularity of mounting face to shaft shall be in accordance with Table 7 of IS : 2223-1983*.

6.1.1 The methods of determination of concentricity of spigot and perpendicularity of mounting face are specified in IS:2223-1983*.

6.2 Tolerances for Hollow Shaft Motors — The values of shaft runout shall not exceed the values given in Table 4. The concentricity of mounting rabbet and perpendicularity of mounting face to the shaft shall be in accordance with Table 7 of IS : 2223-1983*.

6.2.1 The method of determination of accuracies of shaft and mounting face are given in IS:2223-1983*.

7. BEARING ARRANGEMENT

7.1 The top and bottom bearings of the vertical mounted motors shall be selected to withstand the axial thrust loads in addition to the weight of rotor of the motor. The axial thrust loads action the motor bearings when the rigidly coupled pumps do not have provision of their own thrust bearings.

*Dimensions of flange mounted ac induction motors (*second revision*).

(Continued from page 2)

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Telephones: 323 0131, 323 3375, 323 9402 Fax :+ 91 11 3234062, 3239399, 3239382

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